

CHAPTER 2 IS MATTER AROUND US PURE  
CBSE Class 9 – Chemistry

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**Solution: 01**

False

**Solution: 02**

Milk, Paint, Glass

**Solution: 03**

Air is a mixture.

**Solution: 04**

Mercury is a liquid metal and bromine is a liquid non-metal.

**Solution: 05**

Sodium metal is soft and diamond is an extremely hard non-metal.

**Solution: 06**

Diamond is a non-metal which is good conductor of electricity.

**Solution: 07**

Mercury

**Solution: 08**

Carbon is a solid non-metal, bromine is a liquid non-metal and chlorine is a gaseous non-metal.

**Solution: 09**

- (a) Malleability
- (b) Ductility

**Solution: 10**

Non-metals show brittleness.

**Solution: 11**

This means that metals can be drawn into thin sheets and can also be drawn into wires.

**Solution: 12**

This means that non-metals break into pieces when they are hammered.

**Solution: 13**

This means that metals make a ringing sound when we strike them.

**Solution: 14**

This means that metals are shiny in nature.

**Solution: 15**

Mixtures.

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**Solution: 16**

The given statement best describes a compound.

**Solution: 17**

Copper is an element, water is a compound and air is a mixture.

**Solution: 18**

Mixtures are generally heterogeneous in which there is a boundary separation between different constituents.

Solutions are homogeneous mixtures in which no separation is visible between different materials.

**Solution: 19**

Metalloids

**Solution: 20**

(a). An element is made up of only one kind of atoms.

(b). Brine is a mixture whereas alcohol is a compound.

(c). Brass is an alloy which is considered a mixture.

(d). The three important metalloids are boron, silicon and germanium.

(e). The elements which are sonorous are called metals.

**Solution: 21**

(i). H<sub>2</sub>O – Compound

(ii). He – Element

(iii). Cl<sub>2</sub> – Element

(iv). CO – Compound

(v). Co – Element

**Solution: 22**

Elements – Iron, Sulphur, Sodium and Carbon

Compounds – Iron sulphide, Chalk, Washing Soda and Urea

**Solution: 23**

Sugar contains carbon, hydrogen and oxygen.

Common salt contains sodium and chlorine.

**Solution: 24**

A pure substance is one which is made up of only one kind of atoms or molecules.

Examples – Oxygen and sugar.

**Solution: 25**

Two types of pure substances –

(i). Pure substance made up of same kind of atoms.

Example – Sulphur

(ii). Pure substance made up of same kind of molecules.

Example – Water

**Solution: 26**

Ice, iron, hydrochloric acid, calcium oxide and mercury are the pure substances

**Solution 27**

Mixture is another name for impure substances.

Examples – Milk and sea-water.

**Solution 28**

Elements: Mercury, Iron, Diamond, Nitrogen, Graphite, Hydrogen, Oxygen and chlorine.

**Solution 29**

Air is a mixture because-

(i). Air can be separated into its constituents like oxygen, nitrogen, etc. by physical process of fractional distillation.

(ii). Air shows the properties of all the gases present in it.

(iii). Liquid air does not have a fixed boiling point.

Water is compound because –

- (i). Water cannot be separated into its constituents, hydrogen and oxygen by physical methods.
- (ii). Heat and light are given out when water is prepared by burning hydrogen in oxygen.
- (iii). Water has standard b.p. of 100oC under standard atmospheric pressure.

**Solution: 30**

Two solid elements at room temp. – Iron and copper

Two liquid elements at room temp. – Mercury and bromine

Two gaseous elements at room temp. – Hydrogen and oxygen

**Solution: 31**

Hydrogen and oxygen cannot be split up into two or more simpler substances by applying heat, light or electric energy.

Whereas, water can be split up into hydrogen and oxygen by applying electric energy, so it is not an element.

**Solution: 32**

All the elements can be divided into following three groups-

- (i). Metals ; Iron and copper
- (ii).Non-metals ; Carbon and sulphur
- (iii).Metalloids ; Boron and silicon

**Solution: 33**

Metals are malleable and ductile whereas non-metals are not.

**Solution: 34**

(i). Malleability – Metals show this property but non-metals don't.

(ii). Ductility – Metals show this property but non-metals don't.

(iii). Electrical conductivity – Metals are good conductors of electricity whereas non-metals are bad conductors except graphite.

**Solution: 35**

Aluminium is malleable, ductile and sonorous, so it is a metal.

**Solution: 36**

(a). Copper is ductile so it is used for making wires.

(b). Graphite is the only non-metal which conducts electricity so it can be used to make electrodes.

**Solution: 37**

We can check this by evaporating the given colourless liquid. If nothing is left behind then the colourless liquid is pure water.

**Solution: 38**

Sea-water and Soda-water.

**Solution: 39**

Air is a mixture because-

- (i). Air can be separated into its constituents like oxygen, nitrogen, etc. by physical process of fractional distillation.
- (ii). Air shows the properties of all the gases present in it.
- (iii). Liquid air does not have a fixed boiling point.

**Solution 40**

Water is a compound because –

- (i). Water cannot be separated into its constituents, hydrogen and oxygen by physical methods.
- (ii). Heat and light are given out when water is prepared by burning hydrogen in oxygen.

**Solution: 41**

A compound is a substance made up of two or more elements chemically combined in a fixed proportion by mass.

NaCl cannot be separated into its constituents by physical process and the properties of NaCl is completely different from that of Na and Cl, so NaCl is a compound and not a mixture.

**Solution: 42**

A mixture is a substance which consists of two or more elements or compounds not chemically combined together.

As energy is neither evolved nor absorbed during the formation of sugar solution and a sugar solution shows properties of both sugar and water so sugar solution is a mixture not a compound.

**Solution: 43**

Brass is a mixture because-

- (i). It shows the properties of its constituents, copper and zinc.
- (ii). It has a variable composition.

**Solution: 44**

MIXTURES	COMPOUNDS
1. A mixture can be separated into constituents by the physical processes. 2. A mixture shows the properties of its constituents. 3. Energy is usually neither given out nor absorbed in the preparation of a mixture. 4. The composition of a mixture is variable. 5. A mixture does not have a fixed melting point, boiling point, etc.	1. A compound cannot be separated into its constituents by the physical processes. 2. The properties of a compound are entirely different from those of its constituents. 3. Energy is usually given out or absorbed during the preparation of a compound. 4. The composition of a compound is fixed. 5. A compound has a fixed melting, boiling point, etc.

**Solution: 45**

As energy is neither evolved nor absorbed during the formation of salt solution and a salt solution shows properties of both salt and water so salt solution is a mixture not a compound.

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**Solution: 46**

Similarity: In both the cases, the mixture can be separated into their constituents by physical methods.

Difference: No separation is visible in the mixture of sugar and water whereas separation is visible in mixture of sand and sand.

**Solution: 47**

Evaporate both the liquids separately.

A pure compound will evaporate completely, leaving no residue whereas solution will not be evaporated completely, i.e. some residue will be left behind.

**Solution: 48**

(a). Iodine is a lustrous non-metal.

(b). Oxygen is a non-metal required for combustion.

(c). Allotrope of carbon forms good conductor of electricity.  
That allotrope is graphite.

(d). Silicon

(e). Carbon

**Solution: 49**

- (a). Sodium
- (b). Mercury
- (c). Mercury
- (d). Sodium
- (e). Gold

**Solution: 50**

Chlorine gas, Aluminium foil, Iodine vapour, Graphite, Sulphur powder, Diamond are not compounds.

**Solution: 51**

(a). Those mixtures in which the substances are completely mixed together and are indistinguishable from one another, are called homogeneous mixtures. They have a uniform composition throughout its mass. All the homogeneous mixtures are called solutions.

Examples- Sugar solution, salt solution, copper sulphate solution, etc.

Those mixtures in which the substances remain separate and one substance is spread throughout the other substance as small particles, droplets or bubbles, are called heterogeneous mixtures. Heterogeneous mixture does not have a uniform composition throughout its mass.

Example- Starch solution, soap solution.

(b). Homogeneous mixtures – Soda water, air, vinegar, alcohol and water mixture, sugar and water mixture, Copper sulphate solution.

Heterogeneous mixture – Wood, petrol and water mixture, chalk and water mixture.

**Solution: 52**

(a).(i).Elements – An element is a substance which cannot be split up into two or more simpler substances by the usual chemical methods of applying heat, light or electricity.

Ex. Hydrogen, Oxygen

(ii). Compounds – A compound is a substance made up of two or more elements chemically combined in a fixed proportion by mass.

Ex. Sodium chloride, calcium carbonate

(iii). Mixtures – A mixture is a substance which consists of two or more elements or compounds not chemically combined together.

(b). Elements – Gold, Diamond, Graphite

Compounds – Common salt, Sea water, Marble

Mixtures – Brass, Sand, Petroleum, Chalk, Air

### **Solution: 53**

(i). METALS – A metal is an element that is malleable, ductile and conducts electricity.

Example – Iron, Copper

(ii). NON-METALS – A non metal is an element that is neither malleable, nor ductile and does not conduct electricity.

Example – Carbon, Sulphur

(iii). METALLOIDS – The elements which show some properties of metals and some other properties of non-metals are called metalloids.

Example – Boron, Silicon, Helium, Magnesium, Copper

(b). Metals – Mercury, Sodium,

Non-metals – Diamond, Sulphur, Iodine, Carbon, Boron

Metalloids – Silicon, Germanium

### **Solution: 54**

(a). Mixtures – A mixture is a substance which consists of two or more elements or compounds not chemically combined together.

Examples – Air, gun powder.

(b). Homogeneous mixtures- Those mixtures in which the substance are completely mixed together and are indistinguishable from one another, are called homogeneous mixtures.

Examples- Sugar solution, copper sulphate solution.

Those mixtures in which the substances remain separate and one substance is spread throughout the other substance as small particles, droplets or bubbles, are called heterogeneous mixtures.

Example- Starch solution, soap solution.

(c). Other name for homogeneous mixtures is SOLUTIONS.

**Solution: 55**

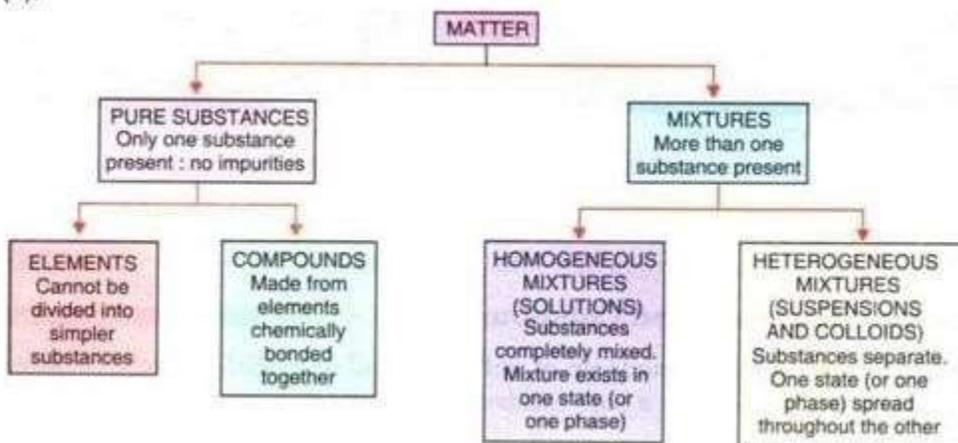
(a). Three general classes of matter are elements, compounds and mixtures.

Element – Hydrogen

Compound – Sodium chloride

Mixtures – Salt solution

(b).



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**Solution: 71**

Steam does not belong to the set. This is because all other are elements while steam is a compound.

**Solution: 72**

- (a). B is a mixture (Fe + S)
- (b). C is a compound (Iron sulphide)
- (c). (i). D is hydrogen sulphide gas  
(ii). E is hydrogen gas
- (d). Gas D has a rotten egg like smell.
- (e). Gas E burns with a 'pop' sound.

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**Solution: 73**

- (a). X must be a mixture. Salt solution is a substance like X.
- (b). Y must be an element. Oxygen is a substance like Y.
- (c). Z must be a compound. Water is a substance like Z.
- (d). Formation of Z (a compound) involves absorption or release of an

appreciable amount of energy.

(e). The three groups are metals, non-metals and metalloids.

**Solution: 74**

(a). Group of materials P is elements.

(b). Q is a non-metal. Example – Carbon and sulphur.

(c). R is a metal. Example – Copper and Aluminium.

(d). S is a metalloid. Example – Boron and Silicon.

(e). R (metals) are malleable and ductile.

**Solution: 75**

(a). B could be an element. It is mercury.

(b). C could be the mixture. It is a salt solution.

(c). A could be a compound. It is an alcohol.

(d). Solid D is Sodium Chloride.

(e). Liquid E is water.

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**Solution: 1**

(a) Solution

(b) Suspension

**Solution: 2**

Solution

**Solution: 3**

Soap solution will scatter light because in true solution i.e. sugar solution, the solute particles are so small that they cannot scatter light rays while in soap solution particles are big enough to scatter light.

**Solution: 4**

Heterogeneous

**Solution: 5**

Percentage method

**Solution: 6**

Mass of water = Mass of solution – Mass of salt (solute)  
= 100 – 15 = 85 g

**Solution: 7**

$$\text{Concentration of solution} = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$$

So, Volume of solution = 100 ml

Volume of water = Volume of solution – Volume of solute (alcohol)

$$= 100 - 12 = 88 \text{ ml}$$

### Solution: 8

(a)

A 5 per cent sugar solution means that 5g of sugar is dissolved in 95 g of water.

### Solution: 9

(a)

A 15% alcohol solution means 15mL alcohol and 85mL water

Solution 10

$$\text{Concentration} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

Given: Mass of salt = 2.5 g and mass of water = 50 g

So, total mass of solution = 50 g + 2.5g = 52.5 g.

Hence,

$$\text{Concentration} = \frac{2.5}{52.5} \times 100 = 4.76\%$$

### Solution: 11

Given mass of urea = 16 g

And, mass of solution = 120 g

So,

$$\begin{aligned} \text{Concentration of solution} &= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100 \\ &= \frac{16}{120} \times 100 = 13.33\% \end{aligned}$$

### Solution: 12

Given volume of alcohol = 5.6 mL

And, volume of water = 75 mL

So, volume of solution = 75 mL + 5.6 mL = 80.6 mL

$$\begin{aligned} \text{Concentration of solution} &= \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100 \\ &= \frac{5.6 \text{ mL}}{80.6 \text{ mL}} \times 100 = 6.9\% \end{aligned}$$

### Solution: 13

Given volume of acetone = 25 mL

And, volume of solution = 150 mL

$$\begin{aligned}\text{Concentration of solution} &= \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100 \\ &= \frac{25}{150} \times 100 = 16.6\%\end{aligned}$$

**Solution: 14**

When the temperature of a saturated sugar solution is increased, it becomes unsaturated.

**Solution: 15**

Unsaturated solution contains less solute at a given temperature and pressure.

**Solution 16**

Physical change-Vaporisation(water changes to water vapour or steam)

Chemical change-Electrolysis(i.e.water forms hydrogen and oxygen)

**Solution 17**

(a) True

(b) False

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**Solution 18**

Colloid

**Solution 19**

Soap solution

**Solution 20**

(a) Colloidal; true

(b) Heterogeneous; centrifugation

**Solution: 21**

(a) Solute-The substance which is dissolved in a liquid to make a solution is called as solute.

(b) Solvent-The liquid in which solute is dissolved is known as solvent.

**Solution: 22**

A solution is a homogeneous mixture of two or more substances whereas a colloid is a kind of solution in which the size of solute particles is intermediate between those in true solutions and those in suspensions.

**Solution: 23**

A colloid is a kind of solution in which the size of solute particles is intermediate between those in true solutions and those in suspensions whereas a suspension is a heterogeneous mixture in which the small particles of a solid are spread throughout a liquid without dissolving in it.

**Solution: 24**

A true solution does not scatter a beam of light passing through it but a colloidal solution scatters a beam of light passing through it and renders its path visible. A true solution is a homogeneous mixture of two or more substances whereas a colloidal solution is a kind of solution in which the size of solute particles is intermediate between those in true solutions and those in suspensions and is a heterogeneous mixture.

**Solution: 25**

True Solutions – Salt solution and sugar solution  
Colloidal Solution – Starch solution, Ink, Blood

**Solution: 26**

The given solution is taken in a beaker. Then, a strong beam of light is allowed to fall on the solution from one side of the beaker in a dark room. If the beam of light is visible in the solution, then it is a colloidal solution.

**Solution: 27**

The path of light beam is illuminated and becomes visible.

**Solution: 28**

A true solution can be distinguished from a colloidal solution by experimenting Tyndall effect. A true solution does not scatter a beam of light passing through it but a colloidal solution scatters a beam of light passing through it.

**Solution: 29**

The particles of a suspension cannot pass through a filter paper whereas particles of colloids can easily pass through filter paper.  
Colloidal solutions are quite stable whereas suspensions are very unstable.

**Solution: 30**

Both the given solutions will be kept stationary in different beakers for some time.

The beaker in which the dissolved particles settle down after some time is a suspension and another one is a solution.

**Solution: 31**

Starch solution and milk will show Tyndall effect.

This is because in a milk solution and starch solution (colloidal solutions) the size of solute particles is big enough to scatter the light passing through it.

**Solution: 32**

Types of solution-

(i). Solid in solid.

Example- Brass

(ii). Solid in a liquid

Example- Tincture of iodine

(iii). Liquid in liquid

Example- ethanoic acid

(iv). Gas in a liquid

Example- CO<sub>2</sub> in water

(v). gas in gas

Example- Air

**Solution: 33**

Solutions – Brine

Suspensions – Chalk water mixture, milk of magnesia, Muddy river water

Colloids – Milk, blood, ink, shaving cream, smoke in air, soda water

**Solution: 34**

(a). Sol – Sol is a colloid in which tiny solid particles are dispersed in a liquid medium. Examples are ink and soap solution.

(b). Aerosol- Aerosol is a colloid in which a solid or liquid is dispersed in a gas. Examples are hairspray and fog.

(c). Emulsion – An emulsion is a colloid in which minute droplets of one liquid are dispersed in another liquid which is not miscible with it. Examples are milk and butter.

(d). Foam- A foam is a colloid in which a gas is dispersed in a liquid medium. Examples are soap bubbles and shaving cream.

**Solution: 35**

The concentration of a solution is the amount of solute present in given quantity of the solution.

**Solution: 36**

If a saturated solution is heated to a higher temperature, then it becomes unsaturated.

If a saturated solution is cooled to a lower temperature, then some of its dissolved solute will separate out in the form of solid crystals.

**Solution: 37**

According to question-

21.5 g of NaCl dissolves in 60 g of water.

So, amount of NaCl which gets dissolved in 100 g of water =  $21.5 \times 100 / 60 = 35.8$  g

Thus, the solubility of NaCl is 35.8 g at 25°C.

**Solution: 38**

According to question-

9.72 g of KCl dissolves in 30 g of water.

So, amount of KCl which gets dissolved in 100 g of water =  $9.72 \times 100/30 = 32.4$  g

Thus, the solubility of KCl = 32.4 g

**Solution: 39**

- i. Cooking of food – Chemical change
- ii. Boiling of water – Physical change
- iii. Cutting of trees – Physical change
- iv. Dissolving salt in water – Physical change
- v. Digestion of food – Chemical change
- vi. Melting of ice- Physical change

**Solution: 40**

- (a) Burning of magnesium wire – Chemical change
- (b) Freezing of water – Physical change
- (c) Rusting of iron – Chemical change
- (d) Glowing of electric bulb – Physical change

**Solution: 41**

- (a) Formation of curd from milk – Chemical change
- (b) Condensation of steam – Physical change
- (c) Growth of plant – Chemical change
- (d) Breaking of a glass tumbler – Physical change

**Solution: 42**

Physical change – Sublimation of solid, Formation of clouds, making of fruit salad from raw fruits, dissolving CO<sub>2</sub> in water

Chemical change – Decomposition of water into H<sub>2</sub> and O<sub>2</sub> by passing electric current

**Solution: 43**

Physical change – Melting of candle wax, mixing of iron filings and sand, breaking a piece of chalk, cutting a piece of paper

Chemical change – Burning of candle wax, burning of wood, burning of piece of paper

**Solution: 44**

When sea water is a mixture of dissolved salts and water only, it is homogeneous solution.

And if sea water contains suspended impurities like decayed plants or animal material, etc. then it is called heterogeneous solution.

**Solution: 45**

Sugar solution, Salt solution, copper sulphate solution and ammonium chloride solution do not show Tyndall effect.

**Solution: 46**

(a). The change in which no new substance is formed is called a physical change.

Example- Melting of candle wax, mixing of iron filings and sand

(b). The change in which new substance is formed is called a chemical change.

Example- Burning of candle wax, burning of wood

**Solution: 47**

(a).

PHYSICAL CHANGE	CHEMICAL CHANGE
1. No new substance is formed in a physical change.	1. New substance is formed in a chemical change.
2. It is a temporary change.	2. A chemical change is a permanent change.
3. It is easily reversible.	3. This process is usually irreversible.
4. Very little heat or light energy is usually absorbed or given out in this process.	4. A lot of heat or light energy is absorbed or given out in this process.
5. Mass of substance does not alter.	5. Mass of substance does alter in this process.

(b). Chemical change – Coal burning in air, making of cake  
Physical change- A glass bottle breaking, wool being knitted into a sweater.

**Solution: 48**

(a). The maximum amount of a solute which can be dissolved in 100 g of a solvent at a specified temperature is known as the solubility of that solute in that solvent .

The solubility of solids in liquids is directly proportional to temperature whereas the solubility of gases in liquids is inversly proportional to temperature.

(b). This statement means that 100 g of water can dissolve a maximum of 20.7 g of copper sulphate at 20oC.

(c). The solubility of solids in liquids increases on increasing the temperature and decreases on decreasing the temperature.

**Solution: 49**

(a). A solution is a homogeneous mixture of two or more substances.  
Example- Salt solution, metal alloys.

(b). A suspension is a heterogeneous mixture in which the small particles of a solid are spread throughout a liquid without dissolving in it.  
Example- Muddy-water, Milk of magnesia.

(c). A colloid is a kind of solution in which the size of solute particles is intermediate between those in true solutions and those in suspensions.  
Example- Soap solution, milk.

**Solution: 50**

(a). A solution in which no more solute can be dissolved at that temperature is called a saturated solution while a solution in which more quantity of solute can be dissolved without raising its temperature is called an unsaturated solution. To test the saturation or unsaturation of a solution, more solute may be added to the solution. If that solute gets dissolved in the solution then the solution will be unsaturated.

To test whether a given solution is saturated or not, add some more solute to the solution and try to dissolve it by stirring. If solute does not dissolve in the given solution, then it will be a saturated solution.

(b). Take some water in a beaker and heat it slowly with the help of burner. Now, start adding sodium chloride salt to the hot water with a spoon and stir it with a glass rod continuously so that sodium chloride goes on dissolving in water. Take

the temperature of water up to 25°C and then keeping this temperature constant, go on adding sodium chloride till no more sodium chloride dissolves in it and some undissolved crystals will be left at the bottom. The contents of the beaker are now filtered and the clear solution obtained is the saturated solution of sodium chloride at 25°C.

If the temperature is lowered from 25°C to 10°C, then some of the crystals of sodium chloride will separate out from the solution in the form of solute crystals.

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**Solution: 66**

Indigestion mixtures are suspensions so there is an instruction written on the bottle of these mixtures “SHAKE IT WELL BEFORE USE”. This is because the particles of indigestion mixture i.e. suspensions are unstable and settle down at the bottom of the bottle after some time.

**Solution: 67**

- (a) Mixtures like A are known as suspensions.
- (b) Mixtures like B are known as colloids.
- (c) Mixtures like C are known as true solutions.
- (d) The phenomenon existed by A and B which occurs on passing a beam of light through them is called Tyndall effect.
- (e) (i) Chalk-water mixture is like A.  
(ii) Soap solution is a mixture like B.  
(iii) Salt solution is a mixture like C.

**Solution: 68**

(a) When solid A is dissolved in water, chemical change takes place. This is because the properties of products B and C are entirely different from those of solid A and water and a lot of heat and energy is evolved in the reaction.

(b) Physical change occurs when solid D is dissolved in water. This is because the product E shows the properties of both, solid D and water.

(c) Sodium metal could behave like solid A.  
Product B is sodium hydroxide.  
Product C is hydrogen.

(d) Solid D is ammonium chloride.

(e) D can be recovered from E by evaporation.

**Solution: 69**

- (a) Solution like X are known as unsaturated solution.
- (b) Solution like Y are known as saturated solution.
- (c) If solution Y at 30°C is cooled down to 10°C by keeping the beaker in crushed ice, then some of the dissolved solid will separate out from the solution and settle at the bottom of the beaker as crystals. This is because the solubility of solid decreases on cooling.
- (d) Solubility is the term used to denote the amount of solid dissolved in 100 grams of water in a solution.

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**Solution: 70**

According to question:

Solubility at 40°C = 41 g

But, solubility = solid dissolved in 100 grams of water in a solution

So, mass of ammonium chloride needed to make a saturated solution of ammonium chloride in 50 g of water at 40°C =  $41/2$  g = 20.5 g

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**Solution: 1**

Carbon disulphide

**Solution: 2**

Sublimation

**Solution: 3**

Sublimation

**Solution: 4**

Sublimation

**Solution: 5**

Camphor undergoes sublimation.

**Solution: 6**

Electromagnet.

**Solution: 7**

Iodine undergoes sublimation.

**Solution: 8**

Fractional distillation

**Solution: 9**

Difference in their boiling point.

**Solution: 10**

Acetone and water

**Solution: 11**

Kerosene and water.

**Solution: 12**

(a) False

(b) False

**Solution: 13**

Air

**Solution: 14**

Fractional distillation of liquid air.

**Solution: 15**

He should choose magnetic separation method to separate iron nails from saw-dust.

**Solution: 16**

Salt and camphor.

**Solution: 17**

Mixture of common salt and water.

**Solution 18**

By filtration.

**Solution: 19**

Filtration

**Solution: 20**

Evaporation

**Solution: 21**

Centrifugation

**Solution: 22**

Centrifugation is used to separate cream from milk.

**Solution: 23**

Filtration

**Solution: 24**

Fractional distillation

**Solution: 25**

Separating funnel

**Solution: 26**

Difference in the densities of oil and water enable their separation by a separating funnel.

**Solution 27**

- (a)Evaporation
- (b)Crystallization

**Solution 28**

Crystallization

**Solution 29**

- (a) Evaporation
- (b) Paper chromatography

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**Solution 30**

Centrifugation

**Solution 31**

Chromatography

**Solution 32**

- (a) Fractional distillation
- (b) Separating funnel
- (c) Fractional distillation
- (d) Boiling points
- (e) Boiling points
- (f) Centrifugation
- (g) Magnet

**Solution 33**

Sugar is soluble in water whereas sand is insoluble in water. The difference in their solubility is used to separate them. The mixture of sand and sugar is dissolved in water, then it is filtered with the help of filter paper. Sand remains as residue on the filter paper while sugar solution is obtained as filtrate. The filtrate is then evaporated to get crystals of sugar.

**Solution: 34**

The difference in the solubility of salt and sand in water is used to separate them from their mixture.

**Solution: 35**

Salt is soluble in water whereas sand is insoluble in water. The difference in their solubility is used to separate them. The mixture of sand and salt is dissolved in water, then it is filtered with the help of filter paper. Sand remains as residue on the filter paper while salt solution is obtained as filtrate. The filtrate is then evaporated to get crystals of salt.

**Solution: 36**

Sugar is soluble in alcohol but salt is insoluble in alcohol, so a mixture of sugar and salt can be separated by using alcohol as solvent.

**Solution: 37**

Sodium chloride is soluble in water whereas sand is insoluble in water. The difference in their solubility is used to separate them. The mixture of sand and sodium chloride is dissolved in water, then it is filtered with the help of filter paper. Sand remains as residue on the filter paper while sodium chloride solution is obtained as filtrate. The filtrate is then evaporated to get crystals of sodium chloride.

**Solution: 38**

Potash alum is soluble in water whereas sand is insoluble in water. The difference in their solubility is used to separate them. The mixture of sand and potash alum is dissolved in water, then it is filtered with the help of filter paper. Sand remains as residue on the filter paper while potash alum solution is obtained as filtrate. The filtrate is then evaporated to get crystals of potash alum.

**Solution: 39**

Sulphur is soluble in carbon disulphide whereas sodium chloride is insoluble in carbon disulphide. The mixture of sulphur and sodium chloride is shaken with carbon disulphide. Sulphur dissolves in carbon disulphide whereas sodium chloride remains undissolved. The solution is then filtered, sodium chloride is obtained as residue. On evaporating the filtrate, carbon disulphide solvent is eliminated and solid sulphur remains behind.

**Solution: 40**

Mixture of iodine and common salt is heated. Iodine sublimates on heating leaving behind common salt and can be recovered in the form of sublimate by cooling its vapours.

**Solution: 41**

Mixture of camphor and sand is heated. Camphor sublimates on heating leaving behind sand and can be recovered in the form of sublimate by cooling its vapours.

**Solution: 42**

Mixture of iron filings and powdered carbon can be separated by using magnet. A horse-shoe magnet is moved on the surface of the mixture. The iron filings are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings is done.

**Solution: 43**

Mixture of iron filings and powdered carbon can be separated by using magnet. A horse-shoe magnet is moved on the surface of the mixture. The iron filings are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings is done.

**Solution: 44**

In factories, scrap iron is separated from the heap of waste materials by using big electromagnets fitted to a crane. When a crane fitted with a powerful electromagnet is lowered on to the heap of waste materials, then the scrap iron objects present in the heap cling to the electromagnet. The crane is then moved up and away to drop these scrap iron objects at a separate place.

**Solution: 45**

In industries, the impurity of iron present in several substances is removed by the use of magnets. Iron objects stick to the magnet leaving behind other objects.

**Solution: 46**

Mixture of iron pins and sand can be separated by using magnet. A horse-shoe magnet is moved on the surface of the mixture. The iron pins are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron pins is achieved.

**Solution: 47**

At first, the mixture of common salt, sulphur powder and sand is shaken with carbon disulphide. Sulphur dissolves in carbon disulphide whereas common salt and sand remain undissolved. The solution is then filtered, common salt and sand mixture is obtained as residue. On evaporating the filtrate, carbon disulphide solvent is eliminated and solid sulphur remains behind. Now, the common salt and sand mixture is shaken with water. Common salt gets dissolved in water. The solution is then filtered, sand is obtained as residue. The filtrate is then evaporated to get crystals of common salt.

**Solution: 48**

The mixture of water, kerosene and sand is filtered with the help of filter paper first. Sand remains as residue on the filter paper while mixture of water and kerosene is obtained as filtrate. The mixture of water and kerosene is then put in separating funnel and allowed to stand for sometime. The mixture separates into two layers according to the difference in the densities of water and kerosene. Water is heavier than kerosene. So, water forms lower layer while kerosene forms upper layer. On opening the stop clock of separating funnel, the lower layer of water comes out first and collected in beaker leaving behind kerosene in the separating funnel.

**Solution: 49**

The mixture of common salt, sand and ammonium chloride will be heated first. Ammonium chloride sublimes on heating and can be recovered in the form of sublimate by cooling its vapours leaving behind mixture of common salt and sand. Salt is soluble in water whereas sand is insoluble in water. The mixture of sand and salt is dissolved in water, then it is filtered with the help of filter paper. Sand remains as residue on the filter paper while salt solution is obtained as filtrate. The filtrate is then evaporated to get crystals of salt.

**Solution: 50**

A horse-shoe magnet is moved on the surface of the mixture of camphor, common salt and iron nails. The iron nails are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron nails occur leaving behind mixture of camphor and common salt. Mixture of camphor and common salt is heated. Camphor sublimes on heating leaving behind common salt and can be recovered in the form of sublimate by cooling its vapours

**Solution: 51**

The mixture of water, groundnut oil and common salt is put in a separating funnel and allowed to stand for sometime. The mixture separates into two layers according to the densities of water and groundnut oil. Water is heavier than groundnut oil. So, water forms lower layer while groundnut oil forms upper layer.

On opening the stop clock of separating funnel, the lower layer of water comes out first and collected in beaker leaving behind groundnut oil in the funnel. Now, solution of water and common salt is heated. Water gets evaporated leaving behind solid common salt.

**Solution: 52**

Mixture of chalk powder, iron filings and naphthalene can be separated by using magnet and then by sublimation. A horse-shoe magnet is moved on the surface of the mixture. The iron filings are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings occur leaving behind mixture of chalk powder and naphthalene. Then, mixture of chalk powder and naphthalene is heated. Naphthalene sublimes on heating leaving behind chalk powder and can be recovered in the form of sublimate by cooling its vapours.

**Solution: 53**

Mixture of iodine, iron filings and salt can be separated by using magnet and then by sublimation. A horse-shoe magnet is moved on the surface of the mixture. The iron filings are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings occur leaving behind mixture of iodine and salt. Then, mixture of iodine and salt is heated. Iodine sublimes on heating leaving behind salt and can be recovered in the form of sublimate by cooling its vapours.

**Solution: 54**

Mixture of iron filings, chalk powder and common salt can be separated by using magnet first. A horse-shoe magnet is moved on the surface of the mixture. The iron filings are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings occur leaving behind mixture of chalk powder and common salt. The mixture of chalk powder and common salt is then dissolved in water and then filtered with the help of filter paper. Chalk powder remains as residue on the filter paper while common salt solution is obtained as filtrate. The filtrate is then evaporated to get crystals of common salt.

**Solution: 55**

Mixture of common salt, sand and iron filings can be separated by using magnet first. A horse-shoe magnet is moved on the surface of the mixture. The iron filings are attracted by the magnet, they cling to the poles of the magnet and get separated. This process is repeated a number of times till complete separation of iron filings occur leaving behind mixture of common salt and sand. The mixture of common salt and sand is then dissolved in water and then filtered with the help of filter paper. Sand remains as residue on the filter paper while common salt

solution is obtained as filtrate .The filtrate is then evaporated to get crystals of common salt.

### **Solution: 56**

The mixture of water and kerosene is put in separating funnel and allowed to stand for sometime. The mixture separates into two layers according to the densities of water and kerosene. Water is heavier than kerosene. So, water forms lower layer while kerosene forms upper layer. On opening the stop clock of separating funnel, the lower layer of water comes out first and collected in beaker leaving behind kerosene.

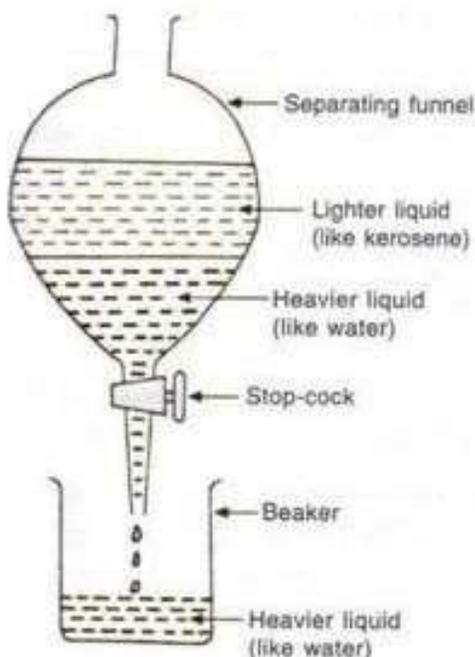


Fig. Separation of kerosene oil and water mixture by separating funnel

### **Solution: 57**

The mixture of mustard oil and water is put in separating funnel and allowed to stand for sometime. The mixture separates into two layers according to the densities of water and mustard oil. Water is heavier than mustard oil. So, water forms lower layer while mustard oil forms upper layer. On opening the stop clock of separating funnel, the lower layer of water comes out first and collected in beaker leaving behind mustard oil.

### **Solution: 58**

The mixture of cooking oil(groundnut oil) and water is put in separating funnel and allowed to stand for sometime. The mixture separates into two layers according to the densities of water and groundnut oil. Water is heavier than groundnut oil. So, water forms lower layer while groundnut oil forms upper layer.

On opening the stop clock of separating funnel, the lower layer of water comes out first and collected in beaker leaving behind groundnut oil.

**Solution: 59**

Mercury, oil and water are immiscible liquids and have different densities. Mixture of mercury, oil and water will be put in separating funnel and allowed to stand for sometimes. The mixture separates into three layers according to the densities of mercury, oil and water. On opening the stop clock of separating funnel, the lower layer formed by mercury comes out first and collected in beaker leaving behind other two layers. Similarly, again on opening the stop clock of separating funnel, the lower layer of water comes out first and collected in beaker leaving behind oil in the funnel.

**Solution: 60**

Sulphur is soluble in carbon disulphide whereas iron filing is insoluble in carbon disulphide. The mixture of sulphur and iron filing is shaken with carbon disulphide. Sulphur dissolves in carbon disulphide whereas iron filings remain undissolved. The solution is then filtered, iron filing is obtained as residue. On evaporating the filtrate, carbon disulphide solvent is eliminated and solid sulphur remains behind.

**Solution: 61**

Centrifugation is used to separate cream from milk. Milk is a suspension of tiny droplets of oil in a watery liquid. It is put in closed container in a big centrifuge machine. When machine is switched on, milk is rotated at very high speed in its container. The cream being lighter floats over the skimmed milk and then can be removed.

**Solution: 62**

Impure copper sulphate is dissolved in minimum amount of water in a china dish to make copper sulphate solution. It is then filtered to remove insoluble impurities. Now, copper sulphate solution is heated gently on a water bath to evaporate water and a saturated solution is obtained. Then heating is stopped and saturated solution of copper sulphate is allowed to cool slowly. Crystals of pure copper sulphate will be formed leaving behind impurities. These crystals are then separated and dried.

**Solution: 63**

Crystallisation is better method for recovering sugar from sugar solution than evaporation because -

(a) Sugar decomposes or get charred on heating to dryness during evaporation. There is no such problem in crystallization.

(b) The soluble impurities do not get removed in the process of evaporation. But such impurities get removed in crystallization.

**Solution: 64**

Chromatography is a technique of separating two or more dissolved solids which are present in a solution in very small quantities. Its two applications are-

(a) Chromatography is used to separate solutions of coloured substances (dyes and pigments).

(b) Chromatography is used to separate small amounts of products of chemical reactions.

**Solution: 65**

(a) Water and kerosene mixture can be separated by using a separating funnel because these are immiscible liquids and they have different densities.

(b) Water and acetone mixture cannot be separated by using a separating funnel because these are miscible liquids.

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**Solution: 66**

The mixture of common salt and ammonium chloride is taken in a china dish and placed on a tripod stand. The china dish is covered with an inverted glass funnel. A loose cotton plug is put in the upper, open end of the funnel to prevent the ammonium chloride vapours from escaping into the atmosphere. The china dish is heated by using a burner. On heating the mixture, ammonium chloride changes into white vapours. These vapours rise up and get converted into solid ammonium chloride on coming in contact with the cold, inner walls of the funnel. In this way, pure ammonium chloride collects on the inner sides of the funnel in the form of a sublimate and can be removed. Common salt does not change into vapours on heating, so it remains behind in the china dish and can be separated out.

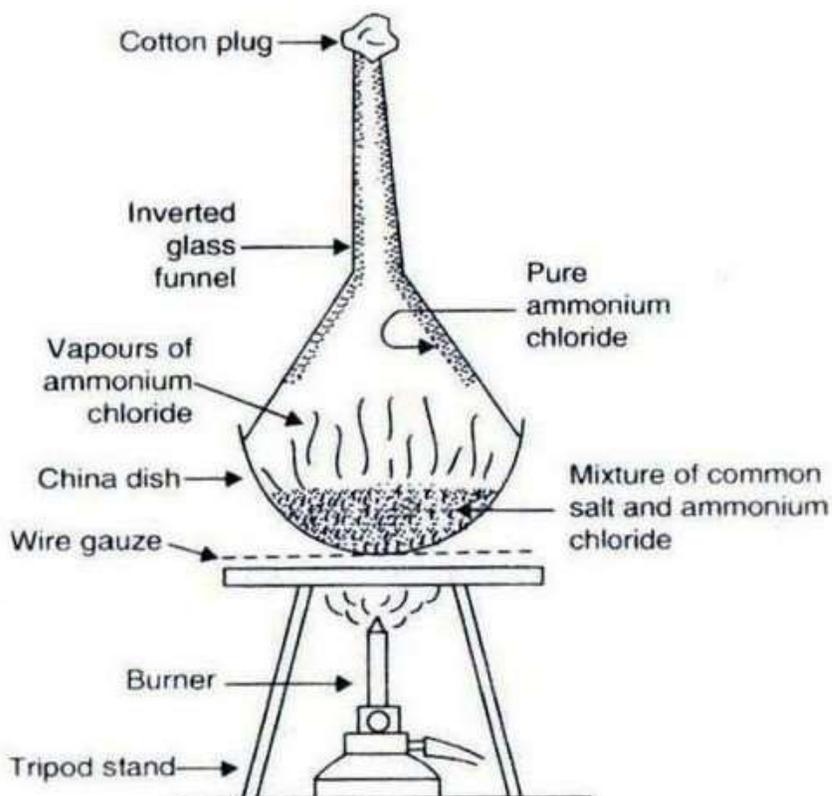


Fig. Separation of mixture of common salt and ammonium chloride by sublimation

Ammonium chloride sublimes on heating whereas common salt does not sublime on heating. So, we can separate ammonium chloride from a mixture of common salt and ammonium chloride by the process of sublimation.

**Solution: 67**

A mixture of common salt and water can be separated completely by the process of distillation. The distillation can be used to separate a liquid from dissolved non-volatile solids.

The salt water mixture is taken in the distillation flask A and heated. Some porcelain pieces are put in the distillation flask to avoid bumping of the solution due to uneven heating. On heating, water forms vapours which rise up and come out through the side tube B of the distillation flask, and go into water condenser

C. Cold water from tap is circulated through the outer tube of condenser for cooling the vapours. The hot vapours get cooled in the condenser to form pure water (i.e. distilled water) which trickles down from the condenser and collects in the beaker

D. Since the salt is non-volatile, so it remains behind in the distillation flask.

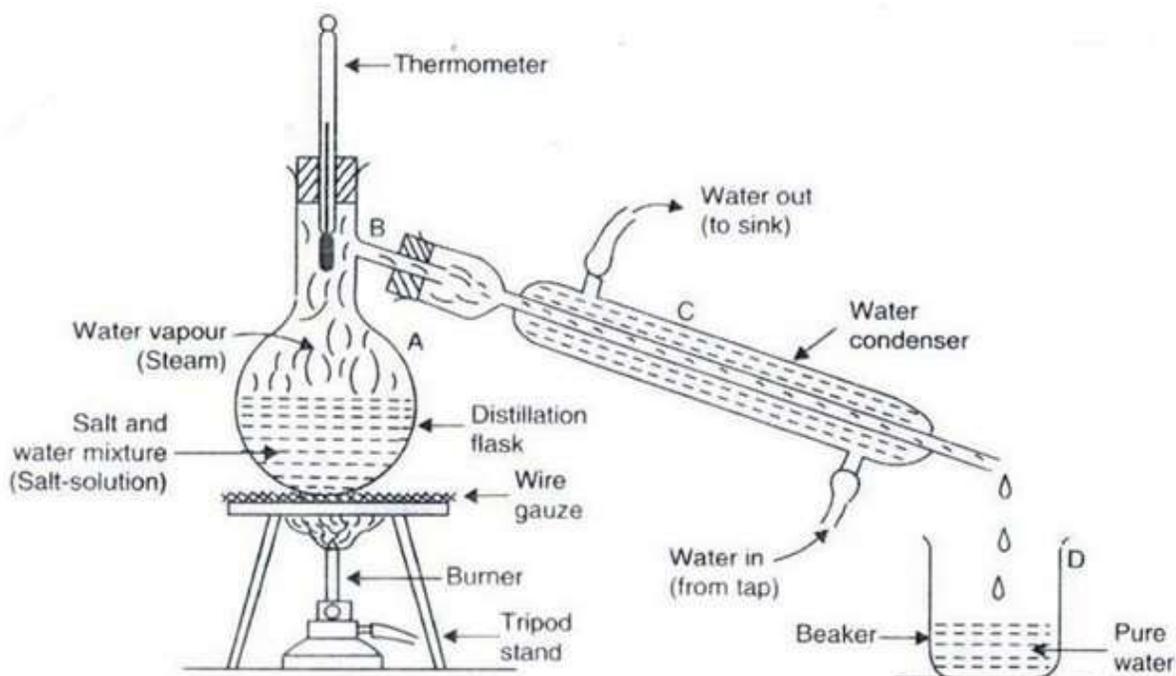


Fig. Separation of mixture of salt and water by distillation

### Solution: 68

In cities, drinking water is supplied from water works where river or lake water is made free from suspended solid substances and germs. In water works, the methods like sedimentation, decantation, loading, filtration and chlorination etc. are used to remove undesirable materials from water. The source of water supply in a city is either a nearby river or lake (reservoir), from there it is pumped into 'sedimentation tank'. Here it is allowed to stand for sometime so that many of insoluble substances present in water settle down at bottom of the tank. From there, it is sent to a 'loading tank' where some alum is added to water. Here suspended clay particles in water get loaded with alum particles, become heavy and settle down at the bottom of the tank. Then, it is passed through 'filtration tank'. It has three layers: fine sand layer at top, coarse sand layer in middle and gravel as the bottom layer. These act as filters and even the small suspended particles get removed when water passes through these layers. Then, the clear water is passed into a chlorination tank. Here, chlorine is added to water to kill the germs present in it. Now, the clean and disinfected water is pumped by pumping station into high storage tanks and from there, it is supplied to homes and factories through the network of big and small pipes.

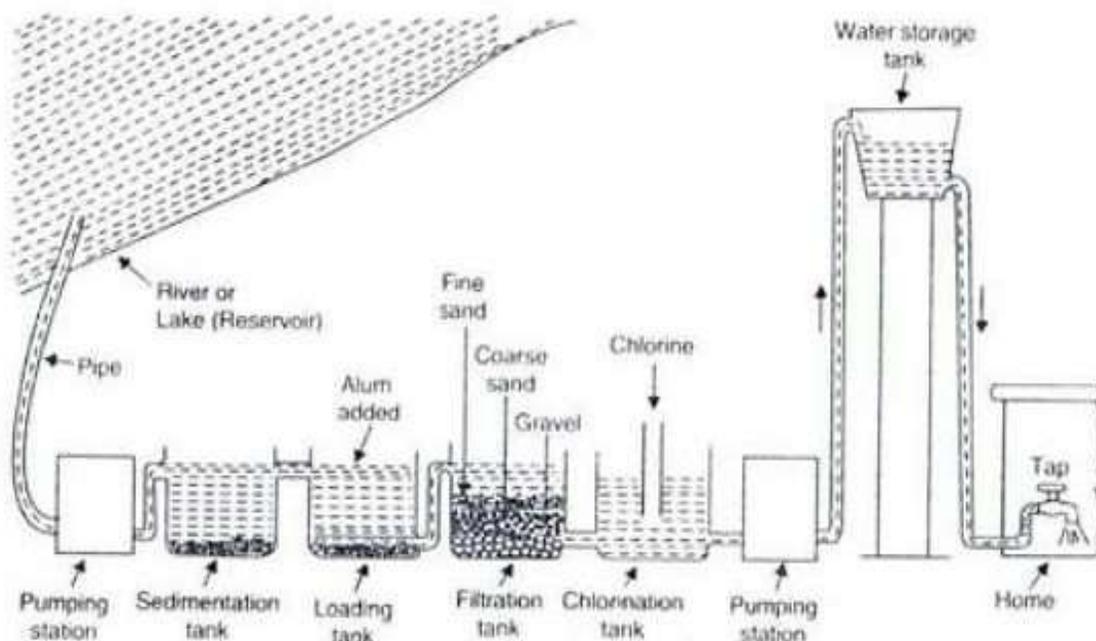


Fig. Water purification process at water works

**Solution: 69**

(a) Fractional distillation is the process of separating two or more miscible liquids (liquids which mix together in all proportions and form a single layer) by distillation, the distillate being collected in fractions boiling at different temperatures. The separation of two liquids by fractional distillation depends on the difference in their boiling points. It is carried out by using a fractionating column.

Fractionating column is a long vertical glass tube filled with glass beads. The glass beads provide a large surface area for hot vapours to cool and condens repeatedly. It provides different temperature zones inside it, the highest temperature being at the bottom of the column and the lowest temperature near its top. It is fitted in the neck of the distillation flask.

(b)

(b)

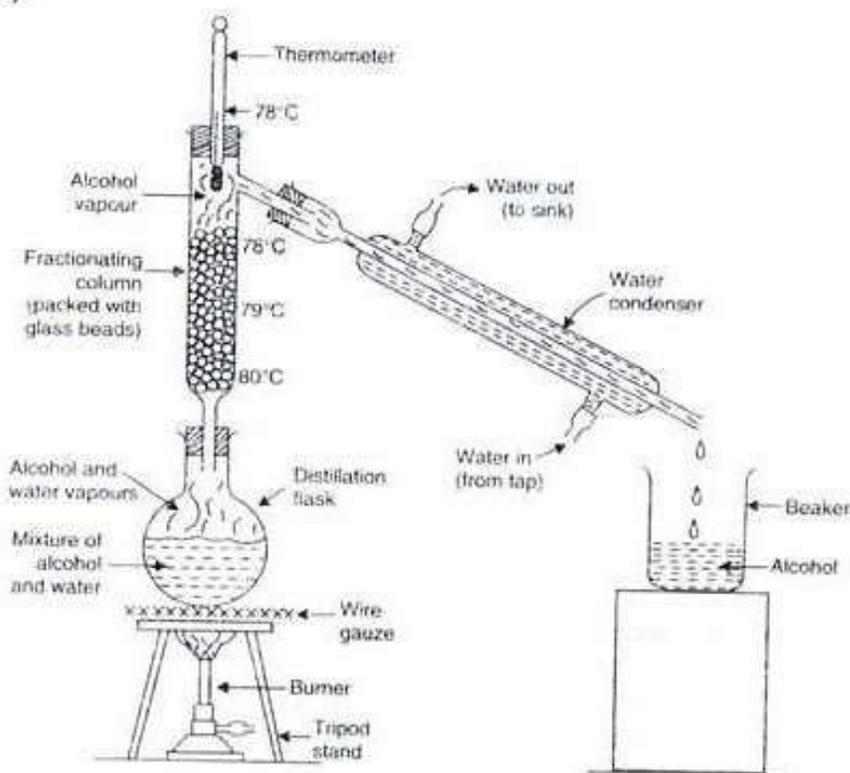


Fig. Separation of mixture of alcohol and water by fractional distillation

**Solution: 70**

(a) Air is mixture of gases like nitrogen, oxygen, argon, carbon dioxide, helium, neon, krypton, xenon etc. The various gases of air are separated from one another by fractional distillation of liquid air. This separation is based on the fact that different gases of air have different boiling points(in liquid form).

The air is first filtered to remove dust, then water vapour and carbon dioxide are removed. Air is compressed to a high pressure and then cooled. The cooled air is then allowed to expand quickly into a chamber through a jet. This cools the air even more. This process of compression, cooling and rapid expansion of air is repeated again and again to make the air more and more cool so that it becomes liquid air. Now, the liquid air is fed into a tall fractionating column and warmed up slowly.

Liquid nitrogen has lowest boiling point of  $-196^{\circ}\text{C}$ . So, on warming, it boils off first to form nitrogen gas and is collected at the upper part of the fractional distillation column. Liquid argon has a slightly higher boiling point of  $-186^{\circ}\text{C}$ . So, it boils off next and collected as argon gas in the middle part of fractional distillation column. Liquid oxygen has a still higher boiling point of  $-183^{\circ}\text{C}$ . So, liquid oxygen boils off last and collected as oxygen gas at the bottom of fractional distillation column.

(b)

(b)

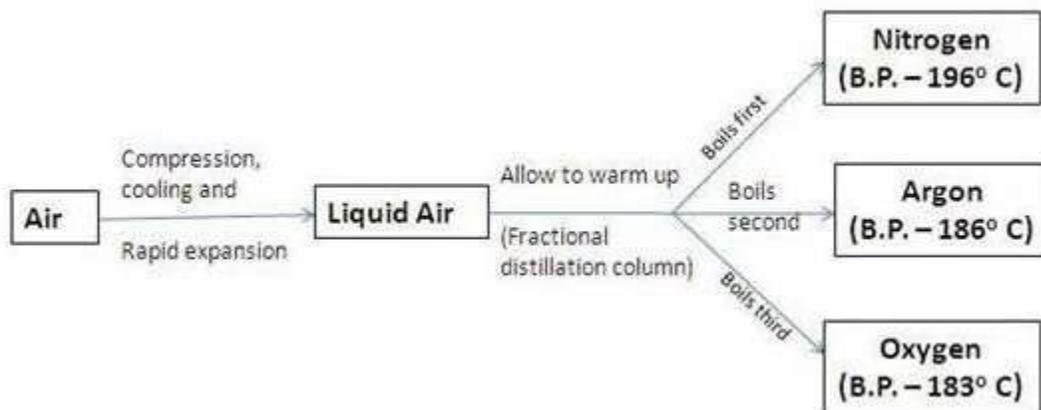


Fig. Separation of major gases of air

Fig. Separation of major gases of air

**PAGE NO 108**
**Solution: 86**

(a) Y will be collected from near the bottom of the fractional distillation column because it has highest boiling point of  $-183^{\circ}\text{C}$ .

(b) Z will be collected from the top part of the fractional distillation column because it has lowest boiling point of  $-196^{\circ}\text{C}$ .

(c) X will be collected from the middle part of the fractional distillation column because it has a boiling point of  $-186^{\circ}\text{C}$  which is lower than that of Y but higher than that of Z.

(d) X is liquid argon; Y is liquid oxygen; Z is liquid nitrogen.

**Solution: 87**

(a) We will use fractional distillation to separate a mixture of A and B.

(b) We will use separating funnel to separate a mixture of B and C.

(c) (i) Alcohol would behave like A.

(ii) Water would behave like B.

(iii) Oil would behave like C.

**Solution: 88**

(a) P is sand; Q is common salt; R is iron filings; S is ammonium chloride.

(b) We first separate R (iron filings) by using a magnet to attract them. Then,

separate S (ammonium chloride) by sublimation. Now, we shake P(sand) and Q(common salt) with water and filter. P(sand) is obtained as residue. Now, we evaporate filtrate to dryness to obtain Q(common salt).

**Solution: 89**

- (a) X is alcohol.
- (b) Y is iodine.
- (c) Process Z is called sublimation
- (d) Process used to recover both the components alcohol and iodine from tincture of iodine is distillation.
- (e) The process used to recover only component Y from tincture of iodine is evaporation.

**Solution: 90**

- (a) (i) Constituent A could be sulphur.  
(ii) Liquid D could be carbon disulphide.
  
- (b) (i) Constituent B could be copper sulphate.  
(ii) Liquid E could be water.
  
- (c) Liquid C could be vegetable oil.
  
- (d) Filter the mixture of A, B and C. C(oil) being liquid will be obtained as a filtrate. Residue consists of A(sulphur) and B(copper sulphate). Add water to the residue mixture, shake and filter. A(sulphur) is obtained as residue. Now, evaporate filtrate to obtain B(copper sulphate)